Implication on EAPMS Energy Efficient Protocol in WSN

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Abstract— The routing in the Wireless Sensor Networks (WSN) is one of the most important investigation areas. There are many routing algorithms which were developed before today. Hybrid ACO-PSO based algorithm is developed to reduce the energy consumption and enhanced the WSN life-time. The comparison is done among the EPMS and Hybrid ACO-PSO based EPMS in the wireless sensor network which named as EAPMS. The planned technique has the flexibility to beat the constraints of the EPMS routing protocol. The comparison has been done upon the following parameters number of alive nodes, dead nodes, packets transferred and remaining energy. This comparison will show that the planned technique outperforms over the market techniques.

Key words: Wireless Sensor Network (WSN), Hybrid ACO-PSO, Alive Nodes, Dead Nodes & Packets Transferred & Remaining Energy

I. INTRODUCTION

Wireless Sensor Networks involve few to thousands of sensor hubs with modern capacities to associate with condition by detecting or controlling physical parameter with intensity of working together among one another to play out the errands. As per Smart Dust program of DARPA, Wireless Sensor Network is" A Sensor Network is an arrangement of gigantic quantities of little, economical, self-controlled gadgets that can detect, register and speak with different gadgets to gather nearby data to settle on worldwide choices about a physical domain".[1] The underlying arrangement of Sensor Network was finished amid Cold War by United States of America when a huge system including acoustic sensors were sent at key areas underneath the sea to follow Soviet Union submarines. The arrangement of Acoustic sensors was characterized as Sound Surveillance System (SOSUS). The sensor arrange conveyed was not remote every one of the sensors are associated by means of wired connections and doesn't have any kind of vitality imperatives. Genuine research on Sensor systems was begun in late 1980s by Defense Advanced Projects Agency (DARPA) through Distributed Sensor Networks (DSN) program. DSN program involved research encompassing acoustic sensors correspondence, propelled strategies in regards to handling, calculations and disseminated programming. [2]

Wireless Sensor Networks have less or no foundation. It includes constrained to huge amounts of sensor hubs working agreeably to screen a specific locale and getting the live information from nature. WSN's are of two sorts: Structured and Unstructured. In Structured WSN, the whole sensor hubs are conveyed after appropriate arranging. In Unstructured WSN, the sensor hubs are sent in specially appointed way in the earth, and after arrangement, sensor hubs work self-sufficiently to play out the assignment of observing, detecting and revealing information. Remote Sensor Networks, when contrasted with customary systems, have its very own impediments and requirements regarding structure and assets like restricted vitality, constrained measure of vitality, less handling capacity, little correspondence extend, less QoS and information stockpiling ability. Research in WSNs is fundamentally done so as to adapt up to these difficulties and to raise refined and propelled sensor hubs with new plan by means of ad libbed directing conventions, new applications organization and new calculations to make sensor hubs less powerless against various sorts of assaults.[3]

Coming up next are the essential highlights of sensor systems:

- Capacity for self-arranging and multi-bounce steering.
- Thick organization and insightful coordinating correspondence capacities with neighboring hubs.
- Dynamic nature of topology change if there should arise an occurrence of hub disappointments or blurring.
- Short range communicate correspondence by means of radio recurrence (RF).
- Confinements as far as memory, calculations and transmission control.

The huge development of remote correspondence not just reduces the reliance on conventional wired systems, yet in addition expands the appropriateness of versatile correspondence and improves its processing power. In WSN, every sensor hub goes about as a switch with capacity of detecting. Despite the fact that, the sensor hubs are profoundly portable working in powerful evolving topology, the convention taking care of all the task ought to have the capacity to deal with the fast topology changes.

II. CLUSTERING

Clustering algorithms are classified based on two main criteria: according to the stability and energy efficiency. Selection of CH in energy-efficient techniques generally depends on the initial energy, residual energy, and average energy of the network and energy consumption rate or combination of these. The properties of cluster are following:

1) Cluster count
2) Intra-cluster topology
3) Connectivity of cluster head to base station.

III. EPMS PROTOCOL ENERGY EFFICIENT PSO PROTOCOL

In this section, reveal description of energy efficient routing protocol is given.

To the most effective of knowledge, Energy efficient PSO based routing algorithm with Mobile Sink support for WSNs, which we name it EPMS for short.[4]

EPMS routing algorithm mainly combines the virtual clustering and mobile sink techniques during routing process. Firstly, it uses the PSO algorithm to divide the network into several regions. In each region, the EPMS uses a similar clustering algorithm to select the cluster head nodes inside each cluster. It combines with the two conditions of the region of the gravity center of the distance and the energy of the node.

Then, the EPMS defines three kinds of data packet formats: Hello, Message-s and Message-h packets. The Hello packet is used to determine which cluster area send data to the mobile sink. The Message-s packet sends data to the sink node, and the Message-h sends information to the cluster head. EPMS can balance energy consumption, prolongs network lifetime and reduces the transmission delay based on the extensive simulation results. [5]

IV. HYBRID ACO-PSO BASED ENERGY EFFICIENT PSO PROTOCOL

Hybrid algorithm has less total link delay and least communication cost compared with conventional ACO. This hybrid algorithm is very useful in mobile communications. This hybrid algorithm exhibits better performances when compared to ACO approach. Ant Colony Optimization (ACO) algorithm uses mobile agents as ants to discover feasible and best path in a network. ACO helps in finding the paths between two nodes in a network and acts as an input to the Particle Swarm Optimization (PSO) technique, a Meta heuristic approach in SI. Particle Swarm Optimization (PSO) finds the best solution over the particle's position and velocity with the objective of cost and minimum End-to-end delay. [6]

In hybrid aco-pso optimization technique ant colony optimization (aco) algorithm uses mobile agents as ants to discover feasible and best path in a network. ACO helps in finding the paths between two nodes in a network and acts as an input to the particle swarm optimization (pso) technique. PSO finds the best solution over the particle's position and velocity with the objective of cost and minimum end-to-end delay. ACO-PSO algorithm is best for solving the path problem. The parameters in aco can be optimized by pso and the parameters can be chosen self-adaptively which enhances the performance of aco. We have proposed the hybrid aco-pso based epms protocol. This protocol adopts the selection of routing using aco-pso approach which outperforms epms. The proposed protocol shows the better improvement over existing protocol it not only reduces the energy consumption of nodes but also adds scalability to the network.[7,8]

V. EXPERIMENTAL SET-UP

In order to implement the proposed technique and implementation has been done. Table 1 has shown a variety of constants and variables required to simulate this work. These parameters are standard values used as benchmark for WSNs. The simulation environment for wireless sensor network is 200 *200 meter and the base station position is moving.

Parameters	Value
Area(x,y)	200*200
Base Station(x,y)	Moving
Number of nodes	100
Probability	0.1
Initial Energy	0.5J
Transmitter Energy	50 nJ/bit
Receiver Energy	50nJ/bit
Free space Energy(amplifier)	1.0nJ/bit/m^2
Multipath Energy	0.0013nJ/bit/m^2

Table 1: Simulation Parameters

We have utilized MATLAB to tentatively check our results. The parameters utilized throughout the whole course of simulation have been recorded in Table 1. Additionally, we have assessed EPMS v/s EAPMS. Here, the performance metrics are alive nodes, remaining energy, dead nodes and packets transferred.

A. Alive Nodes

It is the total number of the nodes that has not expended their energy. This particular metrics also indicates the network lifetime and also gives the idea of the area coverage of the network over time.

B. Remaining Energy

The subtraction of initial energy minus consumed energy will tell the remaining energy present in the nodes.

C. Dead Nodes

It tells the how many nodes are dead according to the rounds.

D. Packets Transferred

It is the total number of the packets or we can say messages that are received by the base station.

The description of all the performance metrics are given below:

E. Alive Nodes

This is the graph of alive nodes in EPMS and EAPMS protocol. It has been found that the number of nodes alive much more in EAPMS protocol. Here, we can see from the graph that the nodes are alive at the round of 1800 in case of EPMS and 2150 in case of EAPMS.

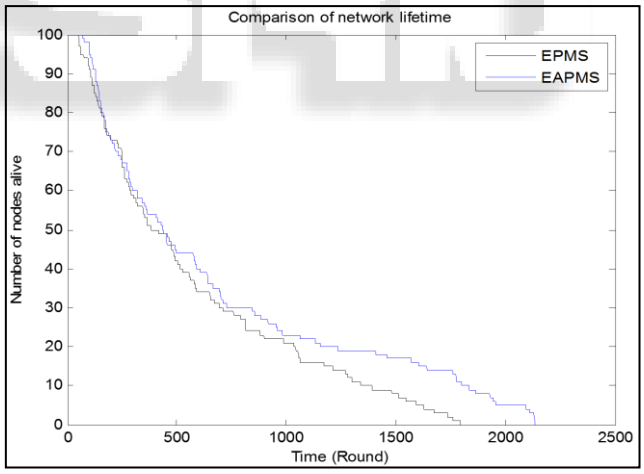

Fig. 2: Alive Nodes versus Rounds

F. Dead Nodes

This is the graph of dead nodes in EPMS and EAPMS protocol. The network lifetime can be evaluated by using the number of dead nodes. It has been found that the number of nodes die earlier in EPMS protocol. Here, we can see from the graph that all the nodes are die at the round of 1800 in case of EPMS and 2150 in case of EAPMS.

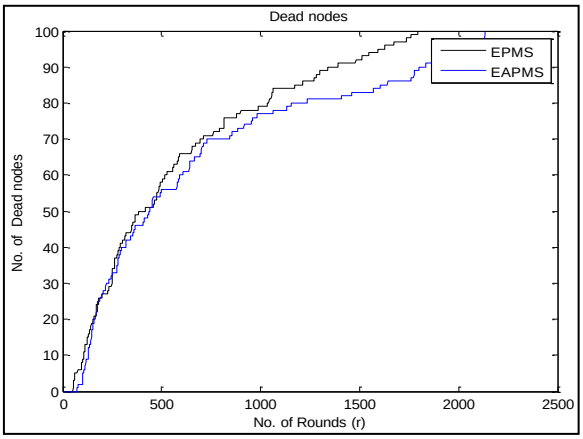

Fig. 3: Dead Nodes versus Rounds

G. Packets send to base Station

This is the graph of Packet send to base station after simulation. This graph shows the total number of packets send to the base station by the sensor nodes. At the round of 1500, the total number of packets send to base station is 2800 in the case of EPMS protocol and in case of EAPMS, the packets send to base station is 3300.

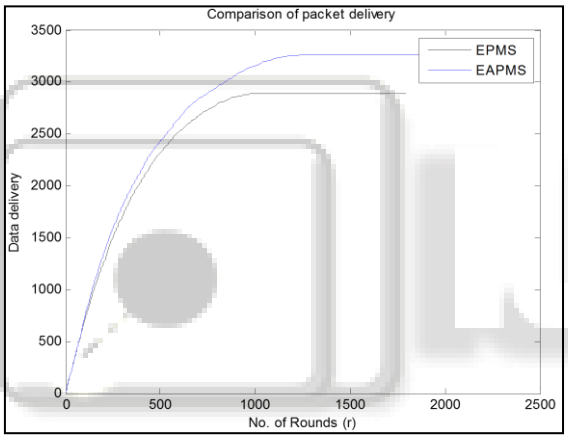

Fig. 4: Packet send to base Station vs Rounds

H. Remaining Energy

This is the graph of remaining energy, how much energy is left with the rounds. From the graph, we can see the remaining energy with EPMS goes to 1800 rounds, whereas in the case of ACO-PSO EPMS the remaining energy goes to 2150 rounds means more work can be done with EAPMS protocol.

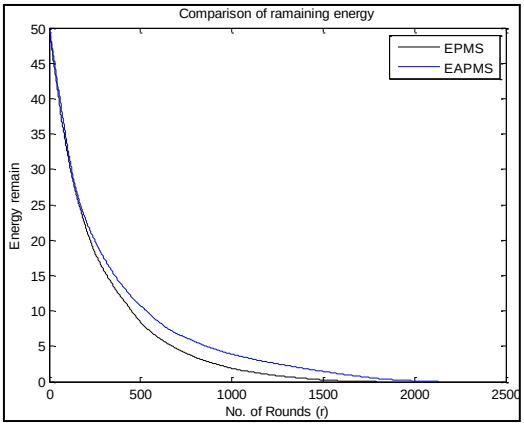

Fig. 5: Remaining Energy vs Rounds

VI. CONCLUSION

To minimize the energy consumption, we proposed a hybrid routing technique which is called EAPMS. EAPMS helps to find out the shortest distance for routing process and thereby enhancement can be done in network lifetime. At the round of 1500, the total number of packets send to base station is 2800 in the case of EPMS protocol and in case of EAPMS, the packets send to base station is 3300. Similarly, the nodes are alive at the round of 1800 in case of EPMS and 2150 in case of EAPMS. Through the extensive simulation, it can be evaluated that the performance of EAPMS is more than that of EPMS. For the proposed work, we are using wireless communication and data analysis toolbox of Matlab2013a. The proposed protocol shows the better improvement over existing protocol.

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